

# A Supplementary Web-based Open-learning Model for Undergraduate Projects: A Case Study

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**ABSTRACT:** *Web-based open learning technology has become a powerful tool to supplement and enhance education. Web-based Open Learning facilitates individualised instruction and hence it is proved to be more effective. This paper proposes a web-based open technology model to supplement a face-to-face teaching project for final-year, full-time, on-campus undergraduate students participating in the Graduation Project 1 and Graduation Project 2 modules at the College of Computer Science and Engineering at Taibah University, Madinah, Saudi Arabia. In particular, it focuses on the use of web-based open material to better prepare and optimise the student's work.*

**Keywords:** Web-based open learning, Open Learning, Learning Flexibility, Personalised Learning

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## 1. Introduction

Web technology has become a powerful tool to supplement learning at the undergraduate level. Web-based open learning (WBOL) facilitates individualised instruction. There has been a considerable growth in the use of flexible methods of delivery for learning and development. However, while designing programmes of flexible learning, there is often the assumption that learners will exhibit uniformity in their learning style, such as the ways in which they process and organise information; in their predispositions towards particular learning preferences; and in the conscious actions that they employ to deal with the demands of specific learning situations. These assumptions lead to the risk of ignoring important aspects of differences in learning styles, preferences and strategies in individuals. [17]

Web-based Open learning (WBOL) is the reflection of the newer methods and tools in the computer aided learning. The benefits of the WBOL include universal accessibility, ease in updating content, and hyperlink functions that permit cross-referencing to other resources [10]. These technical advances, specifically hyperlink and searching capabilities, fit the constructivist learning theory, where learners search out and create their own knowledge bases. [4].

Many Web Based Learning (WBOL) instructional designs fail to incorporate principles of effective learning, and WBOL programs currently do not represent the effective learning principles. Thus the current study proposes a model of WBOL technology to supplement the face-to-face teaching of final-year, full-time, on-campus undergraduate students participating in the Project Research (CS4191) and Project Graduation (CS492) modules at the College of Computer Science and Engineering at Taibah University, Madinah, Saudi Arabia. In particular, it focuses on the use of WBOL material to improve the preparation and optimise the productivity of the students' work.

Hence the current exercise is the reflection of the case study of the research carried out in the particular university settings. The course that we took, CS491 is intended to offer a platform for the students and an opportunity to apply the skills gained during his/her studies at the university and also to engage him/her and motivate. A supervisor is assigned to every group who provides

advice and guidance but leave solutions and implementation details to the student. Besides that, the supervisor evaluates the student's project in terms of quality. The uniqueness is the openness and option to the students to evolve suitable solutions and implementation. This is a clear departure of the earlier practices.

One of the centres to adopt the OL approach was the Training and Employment Section (TES) of the British Refugee Council in the United Kingdom. The OL at TES was established in 1980 to provide trainees with a flexible learning environment (Figure 1). TES is an adult training centre where students are trained for work and higher education. Students of the centre span a wide range of ages and education backgrounds.

Theoretically, the benefit of face-to-face and distance learning methods complement each other. [15] In classroom learning environment, face-to-face learning can help motivate and involve students. On the other hand WBOL can help student to have access learning material anytime and anywhere.

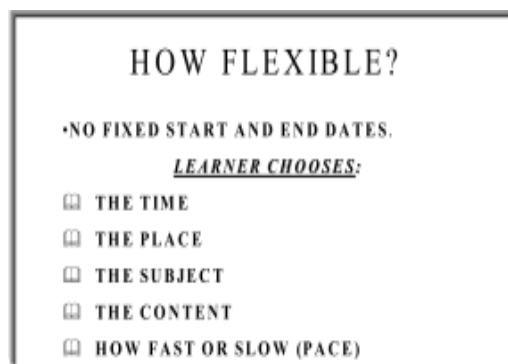


Figure 1. Flexibility of Open Learning

## 2. Web-Based Learning

According to Wonacott (2002), distance the learners' engagement can be enhanced by the use of a suitable design and use of technology. The application of web technology should be appropriate for the learner's "engagement and support, individualisation, meaningful learning (including information technology and problem-solving skills, artistic expression, and construction of knowledge)." (ibid)

The web potentially presents a universal forum for teaching courses. The WBOL model, which is free of the limitations of space and time, reaches students all over the world with great ease. [18] In addition, the WBOL model offers students a wealth of information that cannot be offered through the classroom-based model.

A variety of resources are applied to create an effective, flexible learning environment. The UNESCO definition of Open and Distance Learning (ODL) is more perceptive in that it reflects "the fact that all or most of the teaching is conducted by someone removed from the learner in space and time, and that the mission aims to include greater dimensions of openness and flexibility, whether in terms of access, curriculum or other elements of structure". [18] Open and Distance Learning (ODL) has played a major role in extending educational opportunities in many parts of the world. It can directly improve the accessibility of higher education by facilitating work-based and community-based learning. It has the potential to transform the internationalisation of higher education and is increasingly used as an effective strategy in aiding development.

The ODL system has gained widespread popularity over the years. Innovations in the system have been made possible by continuous experiments and technological developments in this field.

Open and Distance Learning (ODL) institutions employ a variety of approaches in the teaching-learning process that are specially designed to meet the needs of the ever-changing global education scene. Learners are offered access to both flexible and holistic resources. [17] WBOL plays an important role in exploring new frontiers and developments in education.

Rapid changes have taken place in the practice of WBOL, driven mainly by changes in Information and Communication

Technologies (ICT). [14] The revolution in ICT coupled with the social demand for education for all and the need for lifelong and continuing education has resulted in new vistas of open learning for society. [3, 12]

A learner-centric approach plays an essential role in WBOL. Learners exhibit different backgrounds and levels of understanding, and they originate from different segments of the population and different geographical locations.[14] ICT facilitates the teaching of these diverse students in different ways.

The WBOL system, with its flexibility, cost effectiveness and time-tested methodologies, can provide access, equality and quality education to meet the growing needs of the learners. [12, 14]

Although WBOL exhibits obvious benefits for distance-learning students, it also offers a range of learning opportunities for full-time, on-campus undergraduates, many of who need help in increasing their commitment to learning. The use of WBOL in undergraduate curricula is driven by the following:

- The rising expectations of students who use this technology in their education.
- The benefits that the technology offers
- The need to teach increasingly large and diverse groups of students.

The Open Learning (OL) system is catching up with traditional learning methods, particularly in the form of web-based learning, and it could become a 'learning centre hub' that is pivotal in the development and impact of the ever-changing academic environment. The term covers a wide range of resources, teaching methods and strategies. OL is revolutionising the style and method of learning by creating a flexible environment for the trainee.

We have presented below the different WBOL tools that provide varying degrees of location and time flexibility (*Table 1*).

WBOL Tool	Location Flexibility	Time Flexibility
Web pages Access through a web browser to a selection of text, graphics, animations and stored audio and video.	any place	flexible time
Discussion forum Group version of email: learners exchange messages with each other and with the tutor.	any place	flexible time
Chat Learners interact with each other and with the tutor in real time through short messages.	any place	set time
Audio conference A group telephone call: learners receive debriefings from the tutor, discuss learning material and individual / class progress.	any place	set time
Web-cast Live delivery of slides, images or streaming video often accompanied by an audio conference or chat session.	any place	set time

Table 1. Learning Location Flexibility and Time Flexibility  
(Adopted from Gundry John, Knowledge Ability, 2003)

### 3. The Face-to-Face Open Learning Model

In the early 1980s, face-to-face Open Learning (OL) systems started catching up in learning centres around the UK and in the rest of the world. OL became a 'learning centre hub' and was pivotal in the development and impact of the ever-changing educational environment (OL Induction Pack, 7).

The term OL covers a wide range of resources, teaching methods and strategies. OL has revolutionised the style and method of learning by creating a flexible environment for the trainee. [11]

Unlike traditional classroom teaching, the OL approach utilises a broad range of resources, teaching methods and strategies. [5, 8] In traditional classroom teaching, the bulk of the responsibility of class learning management falls on the teacher or lecturer. In addition, the learner must adhere to a strict structured system of learning. In an OL environment, on the other hand, the responsibility falls on the learner, and the student is no longer restricted to the structure of the course as he/she will have flexibility in the course structure. For example, in the case of Information Technology (IT) for a beginner's course, every student is required to adhere to the designed syllabus and fulfil the class requirements. [5, 6] In contrast, OL courses do not impose the above-mentioned structural modes. There is no pre-defined start or end date. A trainee who has already completed a certain part of the syllabus is allowed to skip that part and proceed further. Similarly, a trainee who needs to repeat a part of the previous lesson is allowed to do so (see *Figure 4*).

In accordance with the flexibility of the system content, its pace is also adaptable. Each student controls his or her own pace for each part. Students may choose the parts that they wish to complete quickly and work on the other parts more slowly. Various trainees at different levels can participate in OL. Trainees do not follow any particular fixed syllabus, and trainees are allowed to design their own course and choose their own time and subjects (see *Figure 2*).

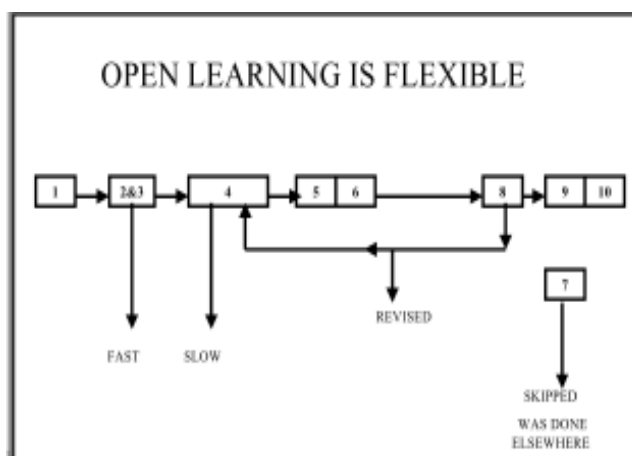


Figure 4. Course Flexibility

#### 4. Problem Statement

At Taibah University, students are required to start an Undergraduate Research Project (CS491) in the first term of the fourth year and their Senior Project (CS492) the following semester. Both projects must either be directly related to computer science or information systems, or they may be multidisciplinary. Both courses mentioned above require students to work in teams with a maximum of four students per team. In many cases, the project requires the group to divide the task among them.

The objective of the course is to provide students with the opportunity to build an integrated project and to study design an actual system for a scientific and commercial application. It offers student an opportunity to bring together knowledge and understanding they have gained from their study, and apply it to a related area.

Some students have trouble with these courses because they may need more time than the predefined one-term duration for each project. Although both courses are supervised and supported by the instructor, it is common for students to sometimes present a poorly structured project that is sometimes out of context of the project requirement. Some students also struggle with the writing aspect of the project. The supervisors have the responsibility to act as an apprentice with regard to providing research experience to students. Despite the general responsibility of the supervisor, the majority of the research and learning is performed by the students. There is a need for a system that helps students by providing advice and guidance beyond the classroom. The advantages and disadvantages of WBOL are mainly dependent on the nature of the WBOL intervention, the intended setting, and the prospective learners.

The amount of time available for students to spend on a research course consists of the time spent in research meetings with the advisor, reading, analysing, writing, and undertaking all other research-related activity.

#### 4.1 Method

A survey questioning of the usability of the system and the attitudes towards the WBOL CS491/CS492 Course was given to the students (below is given more details about the survey). We have presented the description of the explanation of the questionnaires.

	Attitudes Toward CS491/CS492 Course			
	Agree	Neutral	Disagree	Total
I enjoyed working on the CS491/CS492	70%	25%	5%	100%
The online course can help me with the course	70%	10%	20%	100%
The course should be added field experience	95%	2%	3%	100%
I will value interacting with other students in discussion groups	90%	5%	5%	100%
I will value interacting with faculty and supervisory support	89%	4%	7%	100%

Table 1. A Supplementary Web-based Open-learning for CS491/CS492 Learning Delivery

<sup>1</sup>The total number of students surveyed where 92: 54 boys and 38 girls. Age range: between 24 and 27. Academic year: Year 3 and 4. Course type: full time.

##### 4.1.1 Explaining the questions:

- *I enjoyed working on the CS491/CS492 learning:*

This question addresses the students' reactions to the course. Although the majority agreed that the course contributed to their learning, some students expressed reservations about the benefit they gain of the course.

- *An online resources can help us with the course and the course should include field experience:*

This question is related to the benefit of the course for the student. The majority voted for the inclusion of field experience. Field experience such as work placements aim to provide students with the opportunity of using their vocational skills in the workplace and to obtain a realistic impression of working life. This is designed to prepare the student for future employment and provide career development opportunities by exposing students to projects and assignments based on realistic workplace solutions and activities.

- *I will value interacting with other students in a discussion group, and I will value interacting with faculty and supervisory support:*

These questions focus on the collaborative aspect of the course project. Generally, students learn best when they are actively involved in the learning process. Students tend to learn more and retain the content longer when they work in small groups compared to the same content being presented in other instructional formats. Students who work in collaborative groups also appear more satisfied with their classes.

Another very importance aspect of the need of the student is the flexibility of the system. This means that student will be able to work on his/her own time. The student takes controls his/her own pace for each part. Students may choose the parts that he/she wishes to complete quickly and work on the other parts more slowly.

#### 4.2 WBOL Model

Theoretically, the benefit of face-to-face and distance learning methods complement each other. [15] In classroom learning environment, face-to-face learning can help motivate and involve students. On the other hand WBOL can help student to have access learning material anytime and anywhere.

While the face-to-face project supervision course relay on teacher-centred learning, the proposed WBOL is to be provided in a

student-centred learning. The setting can be suited to the requirements of the content and needs of the learner in various proportions. For example, interaction is made possible by the mixture of different technologies: learner-content interaction via web content using graphics, animation, audio, video, interactive quizzes, and progress checks. [19, 2] argue that a collaborative online learning environment can be formed for adult distance students. This leads learners to gain high levels of mastery of course objectives.

A supplementary WBOL may provide a solution to the Research Project for Undergraduates. WBOL is widely claimed to offer flexible “any time, any place” learning opportunities. The claim for “any place” is particularly significant because it facilitates connections with rich learning resources that were impossible to establish in a paper or broadcast distance-learning era. [3, 9] Open and distance learning means there is some flexibility and control in the hands of the learner as to when, where and how he/she will learn, guided by structure and support from a provider.

In practice, providing interactivity restricts e-learning to flexible time periods at best and fixed time periods at worst. In many cases, this is not a problem; learners may easily be able to ‘attend’ online according to their schedule. [9]

OL provides trainees with a flexible learning environment where trainees work on their own time and at their own pace. The system can accommodate trainees from varying backgrounds.

The OL term covers a wide range of resources, teaching methods and strategies, which come in various forms, e.g., Open University, distance learning, access/flexible learning, and correspondence courses (see Figure 3).

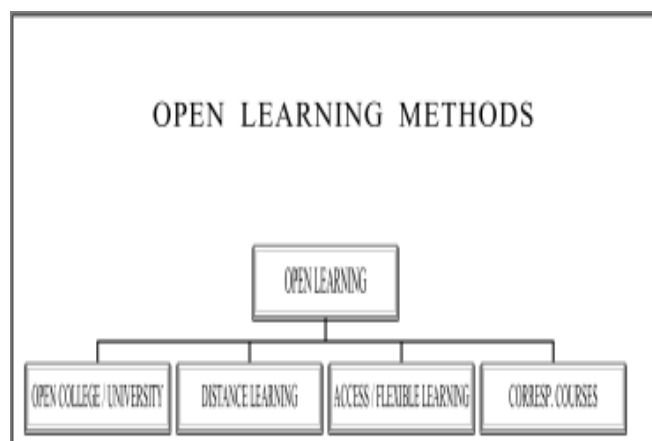


Figure 3. Open Learning Method

In addition to providing flexibility in physical location, WBOL offers flexibility in the time of participation. In contrast to lectures that are delivered at a fixed time, learners can access a WBOL tutorial or virtual patient at any time of the day or night. [7] Participating in an asynchronous online discussion group provides additional flexibility. However, it is tempered by the need to respond to communication from other group members in a timely manner and to adhere to agreed schedules. (ibid.)

All of these types of learning methods share a common scheme. For example, in traditional classroom learning, the bulk of the responsibility of managing learning falls on the teacher or lecturer. In addition, the learner must follow a structured system of learning. In an OL environment however, the responsibility falls on the learner.

The model discussed above provides a crucial role in promoting education by using a flexible learning methodology, which provides students with the following:

1. Access and research sources
2. Quality and effectiveness
3. Cost-effective learning in term of time

The concept of quality can be added to the system of WBOL to improve programmes at the educational institute by (i) ensuring a continuous improvement of total institutional performance, and (ii) evolving mechanisms and procedures for effective and progressive performance.

In the traditional classroom, the student is required to follow a structured learning course. For example, in the case of IT for beginner's course, every student is required to complete a fixed syllabus without stray outside the syllabus structure, and every student must fulfil the class requirements.

In contrast, an OL course does not exhibit the above-mentioned type of structural mode. There is no fixed start or end date. For example, if a trainee has completed the beginning level or part of the syllabus, he or she is allowed to skip that part and proceed with the next. Similarly, if a student wishes to redo a part of a previous lesson, he or she is allowed to do so (see Figure 4).

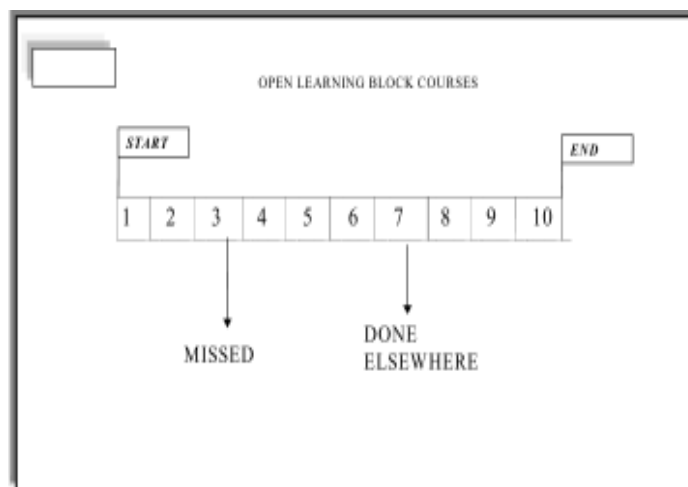


Figure 4. Open learning Block Courses

In addition to the flexibility of the system content, the pace of the course is also adaptable. Each student controls his or her own pace. A student might complete a particular part first and complete other parts more slowly. Various trainees at different levels of courses participate in OL. Trainees are not required to follow any particular session and are allowed to select their own subjects and complete them at their own pace (see Figure 4).

## 5. Discussion and Recommendation

Properly designed WBOL programs can serve to competently deliver educational programs to students. WBOL can also help to standardise the students' learning, ensuring that all students are exposed to essential curricular elements. [13]

Little is known about the effectiveness of WBOL and how this method compares to conventional face-to-face learning methods. The approach is set to be assessed after one course and the effectiveness and efficiency of the method will be tested.

Although the current method of the CS491/492 WBOL course is adapted from the existing face-to-face, Open Learning, case-based model discussed above, its content will be based on the current course material of the College of Computer Science and Engineering at Taibah University.

WBOL involves written course materials, practice guidelines, face-to-face lectures, workshops, self-guided slide shows, and small group sessions. Nevertheless, it is impossible to obtain a significant explanation from these studies. [7] WBOL does not refer to a single entity any more than the terms 'lecture' or 'textbook'.

Face-to-face lectures exhibit a broad variation not only in the quality, but also in the specific instructional methods and course enhancements used. Likewise, WBOL interventions also vary in the instructional methods and course enhancements involved. The suitability of WBOL as a learning technology differs according to the instructional context and objectives. (ibid)

Besides overcoming the barriers of distance and time, the advantages of WBOL include (ibid.). Distance learning, economies of scale, flexible scheduling, easily updated perpetual resources, assessment and documentation as well as novel instructional methods.

With the OL learning style, the resources are personalised and based on individual needs. This method can be used to help the individual trainee's self-development.



Technically, the model is both an extension of the main courses as well as its own extension. Trainees are coached and encouraged to learn by themselves, which leads to an increase in self-confidence and independence. The approach is based on innovation, and it also exhibits a lifelong learning goal and a modular structure.

The model proposes that trainees who register with the system be given an introduction that includes a list of the available resources and an action plan.

The action plan should consist of a form called the Trainee Progress Sheet (TPS), which requires student everyday activity in the system. The TPS can assist the trainee to follow his or her own progress and can also help the instructor to assess the trainee's progress. Generally, the assessments are performed periodically (i.e. every month) and can be used to identify the trainee's achievements and shortcomings with respect to the action plan.

Trainee's success is helped by the following attributes of the learning programme:

- Relevance
- Interest
- Enjoy ability
- Manageability

And by the following provisions of the programme:

- An introduction, explanation, and motivation for learners
- Initial knowledge level assessment
- Available resources - Open Learning, tailored resource material
- Audio / Visual materials
- Interactive software
- Advice, guidance and support
- Modular manuals

### **5.1 Action Plan**

Once student registers with the WBOL system, he/she is set to receive an introduction that includes information about the resources available and an action plan.

The action plan is accompanied by a form called the Student Progress Sheet (TPS), in which the students fill in their daily WBOL activity (Introduction Pact). This is meant to assist the students and the trainers to follow their progress. The TPS also assists the WBOL management with the evaluation and assessment of the student's progress. Generally the assessment, which is performed periodically, determines the student's accomplishments and shortcomings with respect to the action plan.

## **6. Conclusion**

In this current study, we presented a model of a WBOL technology to supplement the face-to-face teaching of final year, full-time undergraduate students at Taibah University, in Madinah, Saudi Arabia. We have built the Project Research (CS4191) and Project Graduation (CS492) modules. In particular, the model focuses on the use of WBOL material to better prepare and optimise the student's work.

Web technology has been proven to be a powerful tool to supplement learning at the undergraduate level. WBOL is purported to facilitate individualised instruction. However, many WBOL instructional designs fail to incorporate principles of effective learning, and WBOL is often used for the wrong reasons (e.g. for the sake of using more technology).

This WBOL model has obvious benefits for learners studying at the university because it offers a range of learning opportunities for full-time, on-campus undergraduates, many of who need help in increasing their commitment to learning. [7]

Supplementing traditional methods of delivering face-to-face learning with WBOL is attractive because it provides a central resource of information that the learner can access at his or her preferred time and place and through which the learner can work at his or her own pace.



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